Monitoring of workers for the presence of an intoxicant or its metabolite is well established as a useful technique in the prevention of occupational disease. Blood lead determinations are an example of this. These 11 papers will present an array of analyses of blood, urine, and exhaled breath for a variety of substances. In so doing, they reiterate at least three themes: First, it is evident that scientific and technological advances are allowing for the analysis of a variety of substances from a diversity of samples such as blood, urine, and exhaled breath. Second, in certain instances, when an agent is absorbed through the skin rather than or in addition to a respiratory route, biological monitoring could present a more accurate estimate of dose than would environmental monitoring of air. On the other hand, with agents that act externally such as dermatological irritants, estimates of internal dose may be less useful. Third, knowledge about the relationship between internal level and both exposure and biological effect is not as far advanced as our ability to measure the intoxicant. It would appear that the challenge to the field of biological monitoring, in addition to development of analytical methods, is the documentation of the relationship of findings to exposure and biological effects and the demonstration of the usefulness of these techniques in the prevention of occupational disease.

Biological Exposure Index as a Complement to the TLV

Larry K. Lowry, PhD

The American Conference of Governmental Industrial Hygienists (ACGIH) has recognized the value of biological monitoring for assessing worker exposure to chemicals. The ACGIH has established a Biological Exposure Indices Committee to review literature, prepare documentation analogous to the widely used TLVs, and recommend biological exposure indices (BEIs) for selected workplace chemicals. The BEIs represent an in-depth review of the literature and address such important issues as routes of exposure, absorption, metabolism, uptake, pharmacokinetics, sampling, methods of analysis, interferences (both chemical and metabolic), and interpretation of results. The recommended BEIs represent levels of some biological parameter that would be found in a worker following an 8-hour exposure (at moderate work) to the current TLV. To date, ten documentations and an introduction have been published by the ACGIH. They include toluene, xylene, ethylbenzene, carbon monoxide, styrene, benzene, n-hexane, lead, phenol, and trichloroethylene. Others are in preparation.

From the Division of Biomedical and Behavioral Science, Biological Monitoring Research Section, National Institute for Occupational Safety and Health, 4676 Columbia Parkway, Cincinnati, OH 45226 (address correspondence to Dr Lowry).

The views presented by the author, a member of the American Conference of Governmental Industrial Hygienists (ACGIH) Biological Exposure Index Committee, represent views of the ACGIH. The recommendations do not represent National Institute for Occupational Safety and Health policy.

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Human exposure to chemicals found in the workplace has traditionally been evaluated by measuring the concentrations of these chemicals in the workplace air, and more recently, in the workers' breathing zone. TLVs published by the American Conference of Governmental Industrial Hygienists (ACGIH), standards established by the American National Standards Institute (ANSI), and the permissible exposure limits (PELs) promulgated from them by the Occupational Safety and Health Administration (OSHA) have served as means to control worker exposure within "safe" limits. Adherence to these limits implies that workers are not expected to experience any adverse effects from exposure.

Measurement of the concentration of substances in breathing zone air does not ensure that the worker is totally protected from adverse health effects resulting from exposure to chemicals in the workplace. The actual body burden of the chemical resulting from all routes of exposure is more directly related to potential adverse health effects. The uptake of the workplace chemical by the inhalation route, absorption of the chemical through the skin or the gastrointestinal tract, and nonoccupational exposure to the chemical all influence the body burden. Interaction of the chemical with other environmental and workplace chemicals may stimulate or inhibit its metabolism and elimination, and thus influence the toxicity of the chemical in the worker. Thus, the environmental concentration of a chemical is related to the body burden of the same chemical under specified conditions only. To more fully evaluate a potential health